NUMERICAL ANALYSIS

Course No: **MM24107DCE** Total Credits: **04**
Semester: **M.A/M.Sc 1st Semester** Total Marks: **100**
Continuous Assessment: **Marks 20**, **Theory Marks: 80** Time Duration: **2½ Hrs Course**

Course objectives: To provide the student with different techniques in order to find approximate numerical solutions to the problems where exact solutions are not available.

Course Outcomes: Students will develop the ability to tackle complex mathematical problems and real-world challenges using numerical methods and techniques. They will gain a deep understanding of various numerical algorithms, their underlying principles, and their applications in solving mathematical and scientific problems.

UNIT-I

Introduction to numerical methods, Bisection method, Method of False position, Secant method, Method of iterations, Newton-Raphson method, Ramanunjan's method, Convergence of iteration methods, Solution of system of linear algebraic equations: Dircet methods, Matrix inverse method, Gaussian elimination method, Gauss Jacobi, Eigen value problem.

UNIT-II

Finite difference operators: Backward, Forward and Central difference operators, Shift operator, Relation between operators, Interpolations with equal and unequal intervals, Newton's forward interpolation formula, Lagrange's and Hermite interpolation formula, Linear and quadratic spline interpolations.

UNIT-III

Numerical differentiation, Formulae for derivatives, Derivative using Newton's forward interpolation formula, Difference interpolating formula, Maxima and minima of tabulated functions. Numerical integration, Trapezoidal rule, Simpson's one-third rule, Boole's rule, Errors in numerical integration formula.

UNIT-IV

Numerical solution for the initial value problems for ODE'S, Taylor's series method, Euler's method, Runge-Kutta Method, Picard's method of successive approximations, Boundary value problems in PDE's, Finite difference methods for solution, Classification of second order PDE's, Finite difference approximations for partial derivatives, Solution of one-dimensional Laplace, Heat and wave equations.

Recommended Books:

1. M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical methods for scientific and engineering computation, New Age International Publishers, 3rd Edition, 1996.
2. S. S. Sastry, Introductory methods of numerical analysis, PHI Learning, 5th Edition 2012.
3. B. S. Grewal, Numerical methods in engineering & science, KHANNA PUBLISHERS.